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The focus of this project, a cooperative effort with MIT, provided software support to investigators and students at MIT for analysis and modeling of data obtained from both the 1991 ARSRP Reconnaissance cruise, and the 1993 Acoustic experiment.

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Final Report
Modelling and Measurements for Acoustic Bottom Reverberation
ONR Grant N00014-91-J-1740

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1 Description of work

The focus of this project, a cooperative effort with MIT, provided software support to investigators and students at MIT for analysis and modelling of data obtained from both the 1991 ARSRP Reconnaissance cruise, and the 1993 Acoustic experiment. To this end:

- We developed a suite of software for the 1991 data, which enabled users to read the 6250 bpi data tapes, apply a conventional beamformer to the multichannel data, and match filter the resulting beams. Programs to produce complex demodulated replicas of source waveforms used in the experiment were included. The programs were distributed to ARSRP participants in a compressed tar file, and was made available over the Internet via anonymous ftp.
- Modifications for the 1993 dataset were made for formatting, beamforming and match filtering data accessed from the ARSRP internet site. Programs were written to process data from both CORY and ALLIANCE datesets.
- We provided support for processing and analysis of the data to students advised by Baggeroer, Schmidt, and Fricke (MIT).
- We processed selected scattering data from bathymetric regions of interest for MIT PIs, especially scattering from B' region, using bistatic data from Cory and Alliance for Schmidt. Wrote programs to manipulate, grid, and plot outputs of Lupien's ARTIST program.
- We transformed MIT student Fan's code for modelling reverberation from arbitrary bottoms for incorporation into Henrik Schmidt's full wavefield Oases package. Replacement of 2D FFT calls with direct FFT evaluations produced faster results.
- A ray theory approach to modelling, similar to Lupien's ARTIST package was developed at WHOI for identification and coregistration of scatterers in the bathymetry with events appearing in the 1993 dataset.

2 ARSRP Students

The following MIT students worked with the PIs at Woods Hole on the ARSRP data:
Dorfman, Yevgeniy Ph.D, 1997
Eggen,Trym Ph.D, 1997
Ellisseeff,Pierre Ph.D, 1998
Fan, Huaiyu Ph.D, 1995
Lupien, Vincent Ph.D, 1998

Ozluer, Riza SM, 1993
Tang, D.J., Ph.D, 1996
Tarayre, Helene Ph.D, 1992

3 Publications, Internal Reports

Baggeroer, A.B., "Hot topics in underwater acoustics", presented at the 125th meeting of the Acoustical Society of America, Ottawa, Canada (May 1993)
Fan, H. and Schmidt, H.,"Three-dimensional scattering and wave-type conversion by delineated features in a stratified sea bed", presented at the 125th Meeting of the Acoustical Society of America, Ottawa, Canada (May, 1993)
Fan, H.,"A Wave Theory Modelling of Three-Dimensional Seismo-Acoustic Reverberation in Ocean Waveguides",PhD Thesis, Massachusetts Institute of Technology(1995)
Lupien, V.H., Fricke, J.R., "Seafloor Insonification Near the Mid-Atlantic Ridge", presented at the 127th Meeting of the Acoustical Society of America,Cambridge,MA (May,1994)
Lupien, V.H., Fricke, J.R., "Co-registration of received signals with bathymetry using ARTIST", J. Acoust. Soc. Am.,98 (5) Pt. 2,November 1995
Lupien,V.,"ARTIST (Acoustical Ray-tracing Insonification Software) Modelling of Reverbarations at B' and C' ", presented at the ARSRP Reasearch Symposium, Woods Hole, MA (July 1995)
Lupien,V.,"The importance of scale structure in scattering from random rough surfaces", PhD Thesis, Massachusetts Institute of Technology (1998)
Lupien,V.,"The role of scale structure in scattering from random rough surfaces", submitted to J. Acoust. Soc. Am., June 1998.
Lupien,V.,"Fractals, wavelets and stochastic interface modelling", J. Acoust. Soc. Am. 102 (5) Pt. 2, November 1997.
Lupien,V.and Baggeroer, A.B.,"The implications of non-fractal seafloor stochasticity on acoustical scattering from the Mid-Atlantic Ridge", J. Acoust. Soc. Am., 102 (5) Pt. 2, November 1997
Schmidt,H. and Kuperman, W.A¿.,"Spectral representations of rough interface reverberation in stratified ocean waveguides", J. Acoust. Soc. Am.,97,2199-2209 (1995)
Tarayre, H.,"Extraction and analysis of lineations in acoustic backscattering from rough bottoms",Masters Thesis, Massachusetts Institute of Technology (1992)

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July 23, 1998

Dr. Jeffrey Simmen, Code 321AO
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Dear Dr. Simmen:

Enclosed is the final report for ONR grant N00014-91-J-1740, entitled "Modelling and measurements for acoustic bottom reverberation," Principal Investigators: Arthur B. Baggeroer and Edward K. Scheer.

Please let me know if you need any further information.

Sincerely,

Shirley Barkley

Shirley Barkley
Staff Assistant

cc: D. Rideout, Administrative Contracting Officer
Director, Naval Research Laboratory
Defense Technical Information Center ✓
M. Tavares, Grant and Contract Services
AOPE Department Office

FTW:sjb